

Claims

What is claimed is:

- 5 1. A method comprising steps of:
 - (a) determining an actuator state;
 - (b) responsive to the actuator state being a settle state, providing constants for a settle controller;
 - (c) responsive to the actuator state being a follow state, providing
10 constants for a follow controller; and
 - (d) generating a control output using the constants provided in step (b) or (c).
2. The method of claim 1 wherein providing the constants for the
15 follow controller includes selecting a first controller from a plurality of controllers, wherein the first controller is optimized for a first performance requirement.
3. The method of claim 2 wherein the first performance requirement is
20 one of rotational/linear vibration and non-repeatable runout.
4. The method of claim 2 wherein selecting a first controller from a plurality of controllers includes:
 - determining a position error signal running average;
 - 25 determining whether the position error signal running average exceeds a predetermined threshold; and
 - responsive to the position error signal running average exceeding a predetermined threshold, selecting the first controller, wherein the first performance requirement is rotational vibration.

5. The method of claim 4 wherein selecting a first controller from a plurality of controllers includes:

applying a low pass filter to the position error signal before determining a position error signal running average.

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6. The method of claim 1, further comprising:

determining a controller state a settle, track follow controller.

7. The method of claim 6 wherein the controller state is determined

10 using the following state equation:

$$x(k+1) = Ax(k) + Bu(k),$$

where $x(k+1)$ is an n-dimensional controller state vector for a time $k+1$, $u(k)$ is an input to the controller, and A and B are constant matrices of appropriate dimensions.

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8. The method of claim 7 wherein the control output is generated using the following equation:

$$y(k) = Cx(k) + Du(k),$$

where $y(k)$ is an output for the settle, track follow controller and C and D

20 are constant matrices of appropriate dimensions, including the constants provided in step (b) or (c).

9. The method of claim 1 wherein providing constants includes providing a reference to a storage location for the constants in a memory.

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10. A method for optimizing a controller, comprising steps of:

(a) determining an actuator state;

(b) responsive to the actuator state being a settle state, providing constants to control the controller as a settle controller;

- (c) responsive to the actuator state being a track follow state, providing constants to control the controller as a track follow controller; and
- (d) generating a control output using the constants provided in step (b) or (c).

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11. The method of claim 10 wherein providing constants for the track follow controller includes selecting a first controller from a plurality of controllers, wherein the first controller is optimized for a first performance requirement.

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12. The method of claim 11 wherein the first performance requirement is one of rotational/linear vibration and non-repeatable runout.

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13. The method of claim 11 wherein selecting a first controller from a plurality of controllers includes:

determining a position error signal running average;

determining whether the position error signal running average exceeds a predetermined threshold; and

responsive to the position error signal running average exceeding a predetermined threshold, selecting the first controller, wherein the first performance requirement is rotational vibration.

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14. The method of claim 13 wherein selecting a first controller from a plurality of controllers includes:

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applying a low pass filter to the position error signal before determining a position error signal running average.

15. The method of claim 10, the method further comprising:
determining a controller state for the settle, track follow controller.

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16. An apparatus comprising:
- (a) at least one actuator;
 - (b) a memory; and
 - (c) a shared state controller, operatively coupled to the at least one
- 5 actuator and the memory, to determine a controller state, select a first controller from a plurality of controllers, receive constants for the first controller from the memory, generate a control output using the constants, and provide the control output to the at least one actuator.
- 10 17. The apparatus of claim 19 wherein the first controller is optimized for a first performance requirement.
18. The apparatus of claim 20 wherein the first performance requirement is one of settle, rotational/linear vibration, and non-repeatable
- 15 runout.
19. The apparatus of claim 19 wherein the controller state is determined using the following state equation:
- $$x(k+1) = Ax(k) + Bu(k),$$
- 20 where $x(k+1)$ is an n-dimensional controller state vector for a time $k+1$, $u(k)$ is an input to the controller, and A and B are constant matrices of appropriate dimensions.
20. The apparatus of claim 22 wherein the control output is generated
- 25 using the following equation:

$$y(k) = Cx(k) + Du(k),$$

where $y(k)$ is an output for the settle, track follow controller and C and D are constant matrices of appropriate dimensions, including the constants provided in step (b) or (c).